Center Innovation Fund: KSC CIF

Electrical Impedance Tomography Technology (EITT)

Completed Technology Project (2012 - 2013)

Project Introduction

The goal for the Electrical Impedance Tomography Technology (EITT) project is to develop a reliable portable, lightweight device providing two-dimensional tomographic imaging of the human body using impedance mapping. This technology could be developed to evaluate health risks and provide appropriate medical care on the International Space Station (ISS), during space travel and on the ground.

Electrical Impendance Tomography (EIT) utilizes a series of electrodes in a circumferential band-like device feeding these signals to a portable computer that generates images similar to a Computerized Tomography (CT) scan using a mathematical algorithm.The development and validatation of this new technoligy could provide reliable portable imaging of the head and chest cavity through the use of EIT. Impedance has been used to gain knowledge of cardiac function for several decades but not used as a scanning technique.

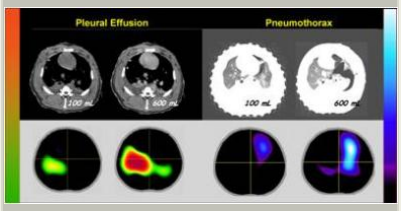
Still early in development, Electrical Impedance Tomography Technology (EITT) is designed to provide images allowing doctors to monitor a patient's airflow or blood flow. While tools such as X-ray, magnetic resonance imaging (MRI) and ultrasound are well known, they don't work well in a space environment due to radiation, user training, size and power usage considerations. These same limitations exist in remote locations on Earth.

The EITT device is a belt of electrodes worn around the portion of the body to be imaged. Once placed on a patient, it sends its observations to a computer, which then converts that signal to a still image or even a stream of live data. This information can be sent from space to the ground, or from remote locations anywhere in the world.

Anticipated Benefits

This project addresses critical NASA requirements to improve Intra-Cranial Pressure (icp) monitoring during launch, ISS flight duration, and postflight. Currently there is no effective way to assess cranial function affected by microgravity or injury. This technology can be developed to evaluate health risks and provide appropriate medical care on the ISS, during space travel and on the ground; real-time imaging of hemodynamics that occur during astronauts in space flight and on return to ground.

Mathematical algorithms will be used to develop an EIT signal that can be translated into a two-dimensional cross-sectional image. These images can detect lung aeration and blood flows inside the chest cavity and can also assess changes in intracranial blood flow and brain swelling that may occur due to trauma, stroke, or the fluid shifts induced by microgravity. This image should provide a dynamic view of the brain or chest showing their actual movement with blood flow and breathing.



Electrical Impedance Tomography Technology (EITT)

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Kennedy Space Center (KSC)

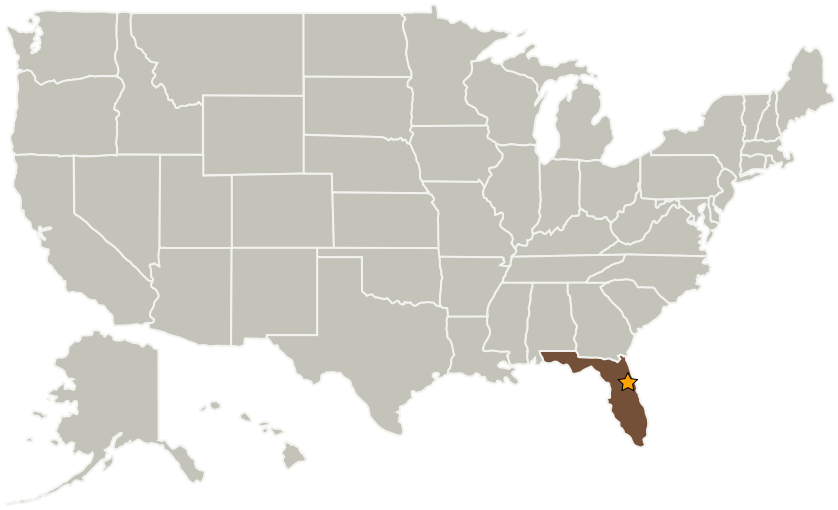
Responsible Program:

Center Innovation Fund: KSC CIF

Electrical Impedance Tomography Technology (EITT)

Completed Technology Project (2012 - 2013)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Kennedy Space Center(KSC)	Lead Organization	NASA Center	Kennedy Space Center, Florida
InoMedic Health Applications, Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB), Veteran-Owned Small Business (VOSB)	
Orlando Regional Medical Center	Supporting Organization	Industry	Orlando, Florida

Primary U.S. Work Locations
Florida

Project Management

Program Director:
Michael R Lapointe

Program Manager:
Barbara L Brown

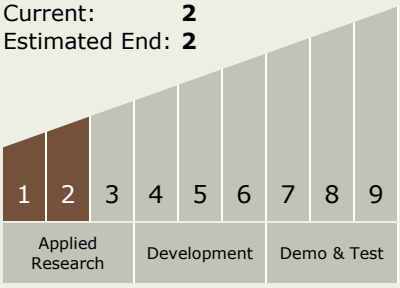
Project Manager:
David A Tipton

Principal Investigator:
David A Tipton

Co-Investigators:
Robert Friedman
Kenneth D Cohen

Technology Maturity (TRL)

Start: **1**
Current: **2**
Estimated End: **2**



Technology Areas

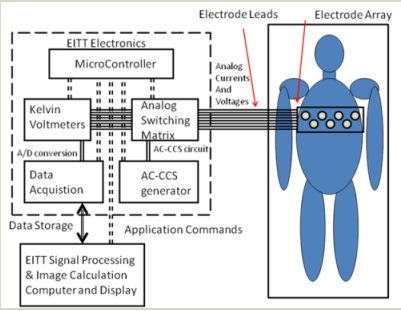
Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.5 Electrical Machines

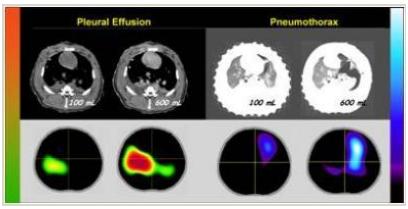
Electrical Impedance Tomography Technology (EITT)

Completed Technology Project (2012 - 2013)

Images



EITT Block Diagram
The EIT Component Block Diagram with Human Thorax Application *(https://techport.nasa.gov/image/2661)*



Electrical Impedance Tomography Technology (EITT)
Electrical Impedance Tomography Technology (EITT) *(https://techport.nasa.gov/image/1545)*